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COHEN, PONTANI, LIEBERMAN & PAVANE LLP
551 FIFTH AVENUE
SUITE 1210
NEW YORK, NY 10176

EXAMINER	
HOLLWEG, THOMAS A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/574,026	BRUNNER ET AL.	
	Examiner	**Art Unit**	
	Thomas A. Hollweg	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,8-11,13,14,16,17 and 20-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,8-11,13,14,16,17 and 20-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Acknowledgment of Amendment

1. Applicant's Amendment of August 19, 2010, is acknowledged. No claims are added or canceled. Claims 1-3, 8-11, 13, 14, 16, 17 and 20-28 are currently pending.

2. The amendments to claims 25 and 26 are acknowledged. The 35 U.S.C. § 112, second paragraph, rejections of claims 25 and 26 are withdrawn.

Specification

3. The disclosure is objected to because of the following informalities:

a. Page 7, line 5, "NT modification" is not understood. It is believed that NT should be either LT or HT.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 23-24 are rejected under 35 U.S.C. 112,** second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. With regard to claims 23 and 24, claim 23 reads "a proportion of the SiN group in the *empirical formula* for said first phosphor is replaced by AlO" (emphasis added). The empirical formula for the first phosphor is $M_{(1-c)}Si_2O_2N_2:D_c$. There is no SiN group identified in this formula, therefore this claim limitation cannot be understood.

7. Applicants argue that one skilled in the art would recognize that the *empirical formula* of the first phosphor comprises a group of $(SiN)_2$. The Examiner respectfully disagrees with this conclusion. The only SiN group identified in the specification, as originally filed, is the Si_3N_4 compound discussed on page 4, line 19 to page 5, line 18, which identifies Si_3N_4 as a starting product of the phosphor. The substitution of AlO for SiN is discussed on page 7, lines 19-21, which read "It is also possible to add a small amount of the AlO group as a replacement for the SiN group in the *molecule* of the oxynitridosilicate of formula $MSi_2O_2N_2$, in particular in an amount of up to at most 30% of the SiN content" (emphasis added). A skilled artisan, reading this description, would understand that AlO can be included in the phosphor molecule by replacing some of the starting product SiN group with some AlO group.

8. Without conceding the point, if Applicants' position is assumed, that the claim limitation "a proportion of the SiN group in the *empirical formula* for said first phosphor is replaced by AlO" is synonymous with replacing the starting product SiN group with some AlO group, the claim would still not be understood. This is because the first phosphor is described as having an empirical formula of $M_{(1-c)}Si_2O_2N_2:D_c$ where each of Si, O and N have a relative proportion of exactly 2. If a proportion of the SiN group were replaced by some AlO group, the resulting molecule would have a structure of M—SiOAlN:Eu, where the proportion of Si and N would be relatively lower as compared to the proportion of O. (This situation is described in previously cited art, Delsing, et al. (U.S. 2005/0205845 A1). Therefore, it cannot be determined if the first phosphor of

claims 23 and 24 has an empirical formula of $M_{(1-c)}Si_2O_2N_2:D_c$ or an empirical formula where the relative proportion of Si and N are lower than the proportion of O.

9. For examination, this claim limitation will be interpreted in a manner which is consistent with the specification and which avoids confusion. That is, a proportion of the SiN group is replaced by some AlO group in the starting materials, however none of the AlO remains in the final first phosphor, so that the empirical formula of the first phosphor can be $M_{(1-c)}Si_2O_2N_2:D_c$ where the relative proportions of Si, O and N are all equal to 2. Under this interpretation, the inclusion of the AlO group as a starting material does not directly contribute the composition of the final product

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 1-3, 9-11, 13, 20 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller et al., U.S. Patent No. 6,717,353 B1, in view if itself.**

12. **With regard to claim 1,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising: a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the

empirical formula $M_{(1-c)}Si_2O_2N_2:D_c$, where M comprises Sr as the main constituent and D is doped with divalent Europium, M=Sr or $M=Sr_{(1-x-y)}Ba_yCa_x$ with $0 \leq x+y < 0.5$ being used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8:Eu$ (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K (Table, col. 4, lines 49-56).

13. Mueller does not expressly disclose an example having a color rendering of Ra > 90.

14. Mueller discloses a white-emitting LED with the same light source and combination of two phosphors as the immediate disclosed device and, in figure 7, and table corresponding to figure 7 (col. 4, lines 49-56), Mueller teaches examples having color rendering indexes as high as 87. Muller further teaches a general formula for the nitridosilicate phosphor ($(Sr, Ba, Ca)_2Si_5N_8:Eu$, col. 3, lines 47-48) which encompasses the formulation containing the specific ratios of Europium and Calcium which renders a device having a color rendering index of greater than 90. (According to the immediate specification, page 11, second full paragraph, the LED will have a Ra of greater than 90 when the second phosphor has a molar ratio of Ca of up to 0.1 and the molar ratio of Eu of 0.05-0.1. These values fall squarely within the ranges disclosed by Mueller). It would require no more than routine experimentation to tune Mueller LED, having the same light source and two phosphors as recited in the claim, to have an Ra > 90, for one skilled in the art, simply by following the teachings of Mueller.

15. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller white-emitting LED where the color rendering of Ra > 90, because a light source having a high Ra will more accurately reproduce colors.

16. **With regard to claim 2,** in figure 4, Mueller discloses that in the oxynitridosilicate the Eu fraction makes up between 0.1 and 20 mol % of M (col. 2, lines 16-23).

17. **With regard to claim 3,** in figure 4, Mueller discloses that a proportion of M is replaced by Ba and/or Ca and/or Zn (col. 2, lines 16-23).

18. **With regard to claim 9,** in figure 7, Mueller discloses that the LED has a color temperature of from 2700 to 3300 K (Table, col. 4, lines 49-56).

19. **With regard to claim 10,** in figure 7, Mueller discloses that the LED achieves the white luminous color by color mixing with the RGB principle, with the primary emission of the blue LED having a peak wavelength of from 430 to 470 nm (col. 3, lines 34-58).

20. **With regard to claim 11,** in figure 7, Mueller discloses that the emission from the chip has a peak wavelength in the range from 450 to 465 nm (col. 3, lines 34-58).

21. **With regard to claim 13,** in figure 4, Mueller discloses that the nitridosilicate contains Sr as a permanent component, and Ca in a proportion of from 0 to 60 mol % (col. 2, lines 16-23).

22. **With regard to claim 20,** in figure 4, Mueller discloses that a proportion of M is replaced by Ba and/or Ca and/or Zn is up to 30 mol% (col. 2, lines 16-23).

23. **With regard to claim 28,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising:

a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the empirical formula $M_{(1-c)}Si_2O_2N_2:D_c$, where M comprises Sr as the main constituent and D is doped with divalent Europium, M=Sr or $M=Sr_{(1-x-y)}Ba_yCa_x$ with $0 \leq x+y < 0.5$ being used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8:Eu$ (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K and at the same time achieving a color rendering of at least Ra = 80 (Table, col. 4, lines 49-56).

24. Mueller is silent as to the dominant wavelength of the first phosphor.

25. Mueller teaches that the first phosphor emits green light (col. 1, line 52), and teaches a specific example of the emission spectrum where the emission of the first phosphor appears to have a peak wavelength in the range from 550 to 570 nm. Based on the teaching of Mueller, in an effort to achieve balanced white light emission, it would be well within the abilities of one skilled in the art to tune the first phosphor so that the dominant wavelength is in the range from 550 to 570 nm.

26. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct, the Mueller white-emitting LED where the first phosphor has a dominant wavelength in the range from 550 to 570 nm to achieve balance white light emission.

27. **Claims 8, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller as applied to claim 1 above, in view of Bischoff, U.S. Patent No. 6,158,882.**

28. **With regard to claim 8,** Mueller discloses all of the limitations, as discussed in the rejection of claim 1, however, it does not expressly disclose that the LED is dimmable.

29. Bischoff, in figure 1, teaches an LED device (10) that is dimmable (col. 2, lines 15-31).

30. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller white-emitting LED so that it is dimmable, as taught by Bischoff. An LED light source that is dimmable is very useful for many applications, such as aircraft cabins (col. 2, lines 50-54).

31. **With regard to claim 16,** Mueller discloses all of the limitations, as discussed in the rejection of claim 1, however, it does not expressly disclose that the system includes electronics for driving the individual LEDs or groups of LEDs.

32. Bischoff, in figure 1, teaches an LED system that includes electronics (50, 80) for driving the individual LEDs (40) or groups of LEDs.

33. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller LED system so that it includes electronics for driving the individual LEDs or groups of LEDs, as taught by Bischoff. Groups of LED that are individually controllable are very useful for illumination applications, as taught by Bischoff (col. 2, lines 50-57).

34. **With regard to claim 17,** Mueller and Bischoff disclose all of the limitations, as discussed in the rejection of claim 16. Further Bischoff teaches that the electronic control (50, 80) includes means which impart dimmability (50) (col. 4, lines 66-67).

35. **Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller as applied to claim 1 above, in view of Ellens et al., U.S. Patent Application Publication No. 2002/0105269 A1.**

36. **With regard to claim 14,** all of the limitations are disclosed by Mueller, as discussed in the rejection of claim 1 above, including that the nitridosilicate has an emission of red (col. 3, lines 45-50) and in figures 7 and 8, the peak emission of the nitridosilicate is shown to be very close to 620 nm. However, Mueller does not expressly disclose that the emission of the nitridosilicate has a dominant wavelength λ_{dom} in the range from 620 to 660 nm.

37. Ellens ('269), in figure 6, discloses a nitridosilicate phosphor (3) where the emission of the nitridosilicate has a dominant wavelength λ_{dom} in the range from 620 to 660 nm [0023].

38. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller LED where that the emission of the nitridosilicate has a dominant wavelength λ_{dom} in the range from 620 to 660 nm, as taught by Ellens ('269) to achieve a high color rendering white light.

39. **Claims 21-22 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller as applied to claim 1 above, in view of Ellens et al., U.S. Patent Application Publication No. 2003/0094893 A1.**

40. **With regard to claim 21,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising: a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the empirical formula $M_{(1-c)}Si_2O_2N_2:D_c$, where M comprises Sr as the main constituent and D is doped with divalent Europium, M=Sr or $M=Sr_{(1-x-y)}Ba_yCa_x$ with $0 \leq x+y < 0.5$ being used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8:Eu$ (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K and at the same time achieving a color rendering of at least Ra = 80 (Table, col. 4, lines 49-56).

41. Mueller does not expressly disclose that a proportion of M is replaced by Li and/or La and/or Na and/or Y.

42. Ellens ('893) teaches an oxynitridosilcate phosphor having a cation comprising (Sr, Ba, Ca) where a portion of cation is replaced by a trivalent metal such as La or Y [0005, 0007, 0038-0041], to tune the color hue and saturation of the phosphor.

43. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller white-emitting LED where M is replaced by Li and/or La and/or Na and/or Y, as taught by Ellens ('893), to tune the color hue and color saturation of the phosphor.

44. **With regard to claim 22,** Mueller and Ellens ('893) teach all of the claim limitations except they do not expressly disclose a proportion of M replaced by Li and/or La and/or La and/or Na and/or Y.

45. It has been held that where the general limitations of the claim are taught by the prior art, discovering an optimum or workable range involves only routine skill in the art (*In re Aller*, 105 USPQ 233 (CCPA 1955)). Based on the teachings of Mueller and Ellens (‘893), it would have been obvious for one having ordinary skill in the art to determine an optimal value for the proportion of M replaced by Li and/or La and/or La and/or Na and/or Y.

46. Therefore, At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Muller and Ellens (’893) LED device, discussed in the rejection of claim 21, where the proportion of M replaced by Li and/or La and/or La and/or Na and/or Y is up to 30 mol%, to optimize the color hue and color saturation of the phosphor.

47. **With regard to claim 25,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising: a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the empirical formula $M_{(1-c)}Si_2O_2N_2:D_c$, where M comprises Sr as the main constituent and D is doped with divalent Europium, M=Sr or $M=Sr_{(1-x-y)}Ba_yCa_x$ with $0 \leq x+y < 0.5$ being

used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8$:Eu (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K and at the same time achieving a color rendering of at least Ra = 80 (Table, col. 4, lines 49-56).

48. Mueller does not expressly disclose that a proportion of Eu of the first phosphor is replaced by Mn.

49. Ellens teaches a phosphor with the co-doping of Eu and Mn so that energy is transferred from the first doping to the co-doping to shift the peak of emission [, 0058, 0061].

50. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Muller white-emitting LED where a proportion of Eu of the first phosphor is replaced by Mn, as taught by Ellens, to shift the peak of emission.

51. **With regard to claim 26,** Ellens teaches a co-doping where Mn is up to 30 mol% [0058, 0061].

52. **With regard to claim 27,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising: a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the empirical formula $M_{(1-c)}Si_2O_2N_2:D_c$, where M comprises Sr as the main constituent and

D is doped with divalent Europium, M=Sr or M=$Sr_{(1-x-y)}Ba_yCa_x$ with $0 \leq x+y < 0.5$ being used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8$:Eu (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K and at the same time achieving a color rendering of at least Ra = 80 (Table, col. 4, lines 49-56).

53. Mueller discloses that the chip is a III-nitride LED (col. 1, line 19), but d does not expressly disclose InGaN.

54. Ellens teaches an LED which is an InGaN chip, because this is a commonly used chip which is very efficient and produces ideal excitation light for the phosphors [0084].

55. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Mueller white-emitting LED where the chip is an InGaN chip, as taught by Ellens, because this type of chip is very efficient and produces ideal excitation light for the phosphors.

Claim Rejections - 35 USC § 102

56. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

57. **Claims 23 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Muller.**

58. **With regard to claim 23,** in figure 4, Mueller discloses a white-emitting LED with a defined color temperature, designed as a luminescence conversion LED, comprising: a primary radiation source (24), which is a chip that emits in the blue spectral region; a layer (26) of first and second phosphors in front of said source (24), both of which phosphors partially convert the radiation of the chip (24) (col. 3, lines 1-12); wherein the first phosphor is from the class of the oxynitridosilicates having a cation M and the empirical formula $M_{(1-c)} Si_2O_2N_2{:}D_c$, where M comprises Sr as the main constituent and D is doped with divalent Europium, M=Sr or $M=Sr_{(1-x-y)}Ba_yCa_x$ with $0 \le x+y < 0.5$ being used, the oxynitridosilicate completely or predominantly comprising the high-temperature-stable modification (col. 2, lines 16-42); and wherein the second phosphor is a nitridosilicate of formula $(Ca,Sr)_2Si_5N_8{:}Eu$ (col. 3, lines 42-51), producing a color temperature of from 2300 to 7000 K and at the same time achieving a color rendering of at least Ra = 80 (Table, col. 4, lines 49-56).

59. The Examiner notes that the claim limitation “a proportion of the SiN group in the empirical formula for said first phosphor is replaced by AlO” is drawn to a precursor material which is incidental to the claimed apparatus. It is noted that there is no Al component in the empirical formula for first phosphor, so this precursor material does not directly contribute the composition of the final product. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the

limitation claiming the composition of a precursor material has been considered, but not patentably distinct over Mueller (see MPEP 2113).

60. **With regard to claim 24,** the claim limitation "wherein the proportion of the SiN group is the empirical formula for said first phosphor replaced by AlO is up to 30 mo”%" is drawn to a precursor material and does not therefore distinguish claim 24 over Muller, as explained in the rejection of claim 23.

Response to Arguments

61. Applicants argue that for one skilled in the art to arrive at a device having a color rendering Ra greater than 90 from the teachings of Mueller, one would have to pick and select from an infinite number of possibilities. The Examiner respectfully disagrees with this conclusion for the following reasons.

62. First, color temperature in the claimed device and in the Mueller device is achieved by the combination light of three wavelengths of light. The first wavelength radiates from the LED chip, which is the same in both the claimed device and the Mueller device.

63. The second wavelength radiates from the first phosphor. As explained in the previous office action, it is not disputed that the claimed first phosphor and the Mueller first phosphor are the same. However the claimed first phosphor is a narrower version of the phosphor disclosed by Mueller (col. 2, lines 16-42). As explained by Applicants on page 11 of the Remarks, to arrive at the claimed first phosphor from the Mueller phosphor, one would only have to choose a value of 2 for the variables x, y and z. The allowed range for these variables is 1.5-2.5. The value 2 is directly in the middle of this

range and would be the most likely selection by one skilled in the art. One would also have to choose the value 0.0 for variable c (representing the amount of Ba). Choosing 0.0 is likely in view of the disclosure of Mueller, because Mueller identifies Sr as the major component of the phosphor (frequently described as Sr—SiON:Eu^{2+}), and because in the one specific example, 0.0 is chosen as the value for variable c (amount of Ba) (col. 5, lines 22-30). Therefore, by selecting likely values, in the middle of disclosed ranges and values that are used in Mueller examples, one skilled in the art would arrive at the first claimed phosphor.

64. The third wavelength radiates from the second phosphor which emits red light. Mueller gives three examples of red phosphor, one if which is $(Sr_{1-a-b-c}Ba_bCa_c)_2Si_5N_8:Eu_a$. Because there are only three examples given, it is likely for one skilled in the art to choose this phosphor. As with the first phosphor, it is not disputed that the claimed second phosphor and this red phosphor are the same. Again, the claimed second phosphor is a narrower version of the red Mueller phosphor. To arrive at the claimed second phosphor, one would have to choose 0.0 for variable b of the red Mueller phosphor (allowed values are 0.0-1.0). This is a likely selection because in the example given by Mueller of this phosphor, the chosen value for b is 0.0 (col. 4, lines 38-46). The allowed range for variable c (amount of Ca) is from 0.0-1.0. Applicant’s recommended amount of Ca is “preferably" up to 0.1 (Spec., page 11, line 25). The allowed range for variable a (amount of Eu) is 0.002-0.2, or 0.2 to 20%. Applicant's recommended amount of Eu is from 3 to 15%, or preferably 5 to 10% to achieve high color rendering (Spec. page 11, lines 19-26). Therefore, by selecting

values that are in the center of the allowed range for both variables c and a, a skilled artisan would arrive at the claimed second phosphor.

65. Therefore, contrary to Applicant's position, to arrive at the present invention from the teachings of Mueller, one would not have to pick and select from an infinite number of possibilities, but rather use the Mueller LED chip and likely formulations of the first and second phosphors, as guided by the Mueller disclosure.

66. Specific examples of the Mueller device using both claimed phosphors, where the color rendering Ra is below 90 does not comprise a teaching away. The third table of column 4 of Mueller has a specific example where the color rendering Ra is 87. One skilled in the art would understand that ratios of components in the phosphors may be adjusted to raise the color temperature. An example of the color temperature at 87 does not teach away from, criticize, discredit or otherwise discourage from an alternative formulation which may give a color temperature over 90.

67. With regard to claim 28, Applicant argues that because there are number of variables with regard to the formulation of the first phosphor, that picking and selecting a specific value or range for each of these variables would result in an infinite number of different combinations. This argument is not persuasive for three reasons. First, there are 6 variables with regard to the first phosphor and each variable constrained by a narrow range. Second, one skilled in the phosphor arts would understand how adjust the amount of each compound to achieve a desired result, so they would be able to pick and select values based on this understanding. Third, the specific goal of the Mueller device and the present device is to achieve white light (Mueller, Abstract) (Spec. page

2, line 15). Therefore, one skilled in the art would be able to select values for the 6 variables to achieve the peak wavelength of claim 28, in order to achieve balanced white light emission.

68. For these reasons, Applicant's arguments are not found to be persuasive.

Conclusion

69. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

70. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

71. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas A. Hollweg whose telephone number is (571) 270-1739. The examiner can normally be reached on Monday through Friday 7:30am-5:00pm E.S.T..

72. If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

73. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TH/

/Peter J Macchiarolo/
Primary Examiner, Art Unit 2879